NATIONAL TRANSPORTATION SAFETY BOARD
Office of Research and Engineering
Materials Laboratory Division
Washington, D.C. 20594

April 5, 2022

MATERIALS LABORATORY FACTUAL REPORT Report No. 22-022

A. ACCIDENT INFORMATION

Place	:	Briggs, Texas
Date	:	July 30, 2021
Vehicle	:	HpH, Spol. S.R.O. Glasflügel 304S, N304AB
NTSB No.	:	CEN21LA346
Investigator	:	Andrew Todd Fox, ASI – CEN

B. COMPONENTS EXAMINED

Elevator control rod (in multiple pieces) from vertical stabilizer.
Rubber sealing boot.

C. DETAILS OF THE EXAMINATION

Pieces of an elevator control rod and a rubber sealing boot were submitted to the NTSB Materials Laboratory for examination as shown in figure 1. The control rod was sectioned at three locations prior to shipping and fractured in two locations at its lower end. By design, the rod sits inside the vertical stabilizer in a vertical orientation. The upper end is terminated by a rod end bearing and the lower end is terminated by a clevis fitting. The sealing boot is installed over the rod at its upper end.

The control rod had fractured in the circumferential direction at two locations at the lower end adjacent to the clevis fitting, as shown in figures 2a and 2b. The fractures were coplanar with the upper and lower faces of a plug of corrosion product that had filled the majority of the inner cavity and measured between approximately 9 mm and 15 mm (between approximately 0.35 inch and 0.60 inch) in length. The fracture surfaces were examined and exhibited features consistent with overstress and loss of wall thickness due to corrosion. The clevis fitting at the lower end of the rod was examined for indications of a drain hole but no drain hole was observed, as shown in figure 2c.

The control rod had also fracture in the longitudinal direction near the rod's upper end, as shown in figures 3a and 3b. The midpoint of the fracture was approximately 55 mm (2.2 inch) from the upper end of the rod and it extended approximately 40 mm (1.6 inch) in the longitudinal direction. The fracture surfaces were corroded as was the inner surface of the tube and the surrounding paint was bubbled and stained. The tube material bulged outward on either side of the fracture. The features were consistent with internal corrosion and an overstress fracture. The outside of the tube above the longitudinal fracture exhibited a dark stain over a length of approximately 22 mm

(0.87 inch), as shown in figure 3c, consistent with contact with the collar on the rubber boot. The stain extended just above the level of the witness hole.

Internal corrosion was observed along the entire length of the rod, as shown in figures 4a and 4b. Figure 4a shows the inner tube surface at the lower end fracture where little wall thickness remained. Figure 4b shown the tube near its midpoint, where corrosion product was observed on the inner surface as well as spots where the corrosion had consumed the wall material.

Donald Kramer, Ph.D.
Sr. Materials Engineer

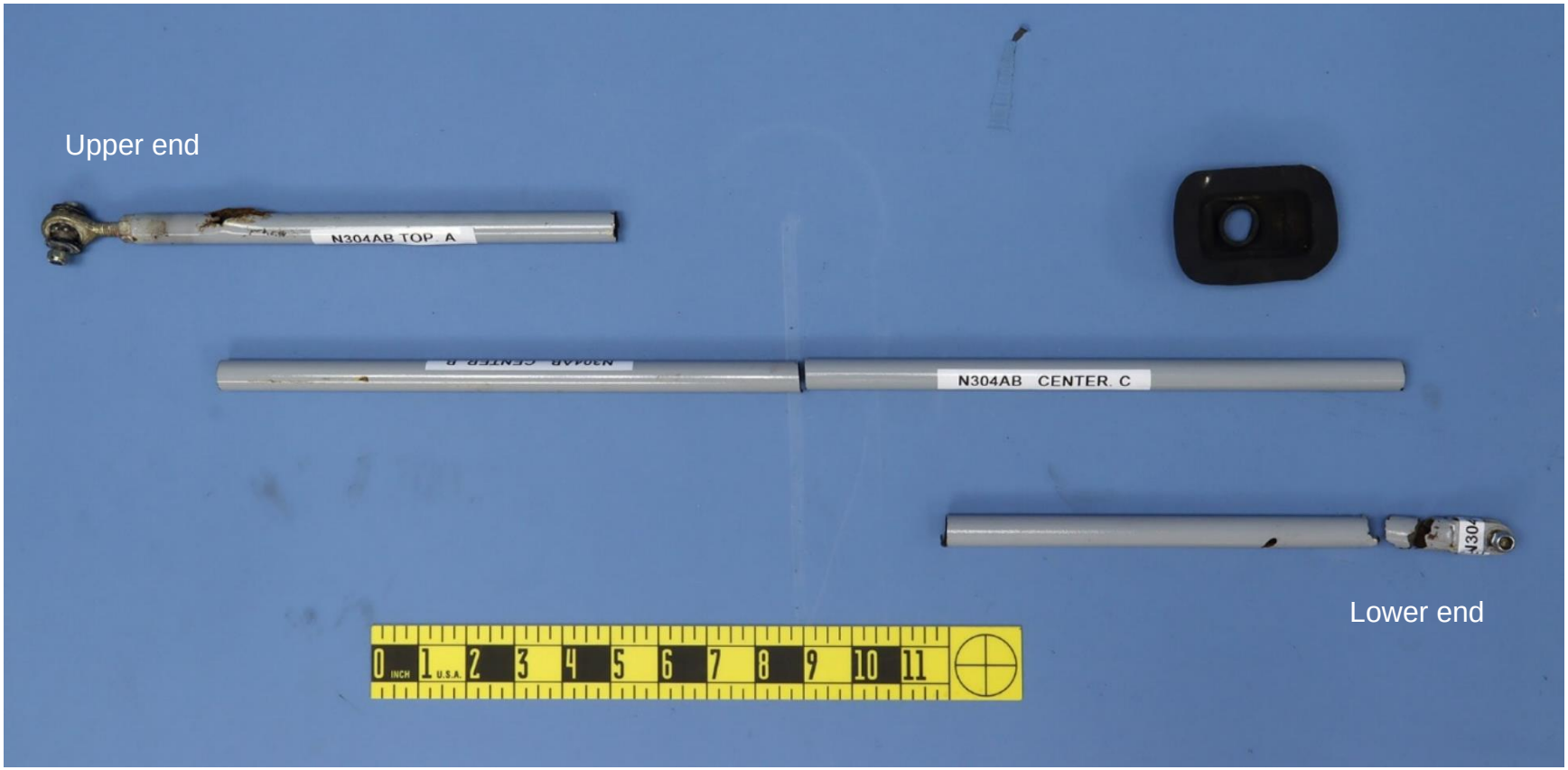


Figure 1: Image of the elevator control rod pieces and rubber boot as received.

a)

b)

c)

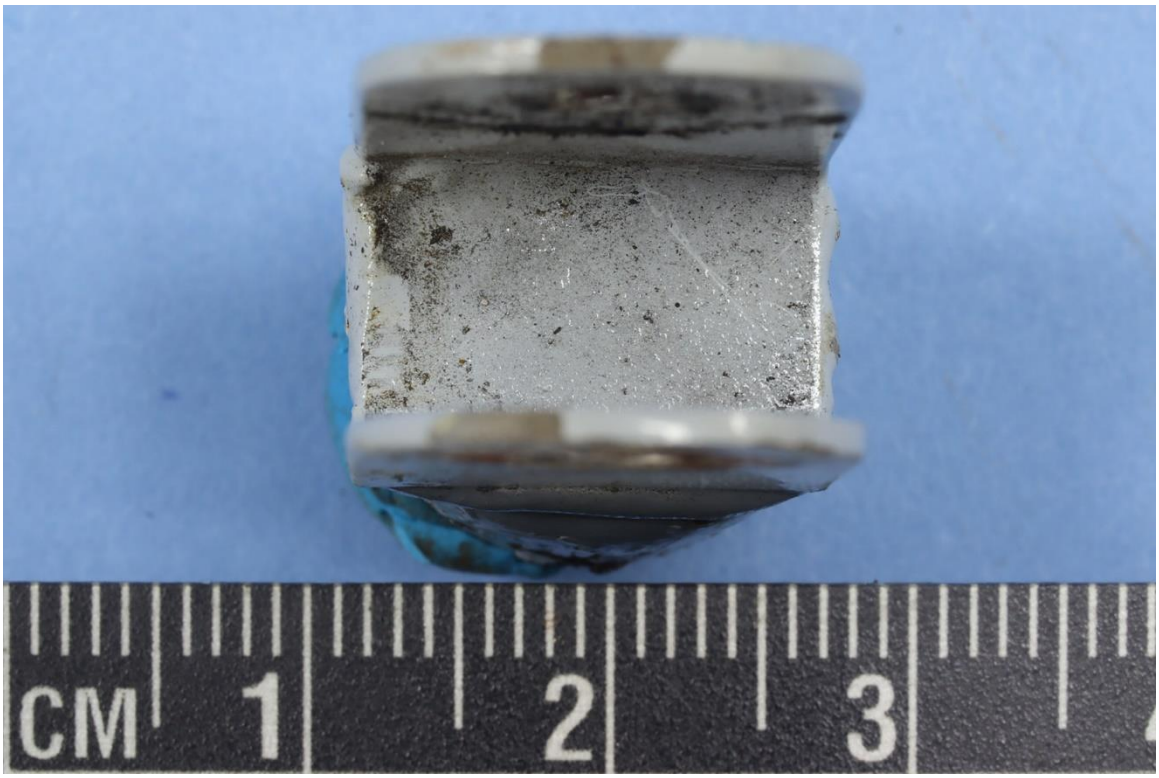
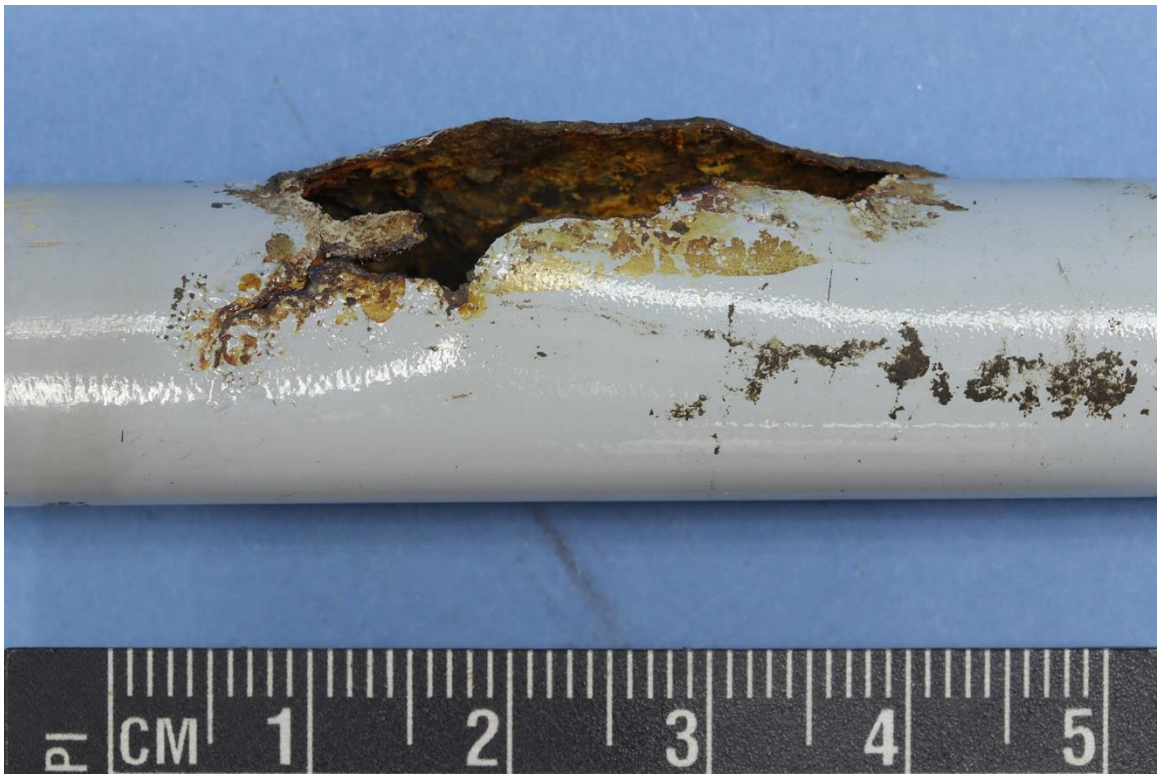


Figure 2: The lower end of the control rod: a) and b) two views of the fractured end and c) image of the clevis end fitting shown no drain hole present.

a)



b)

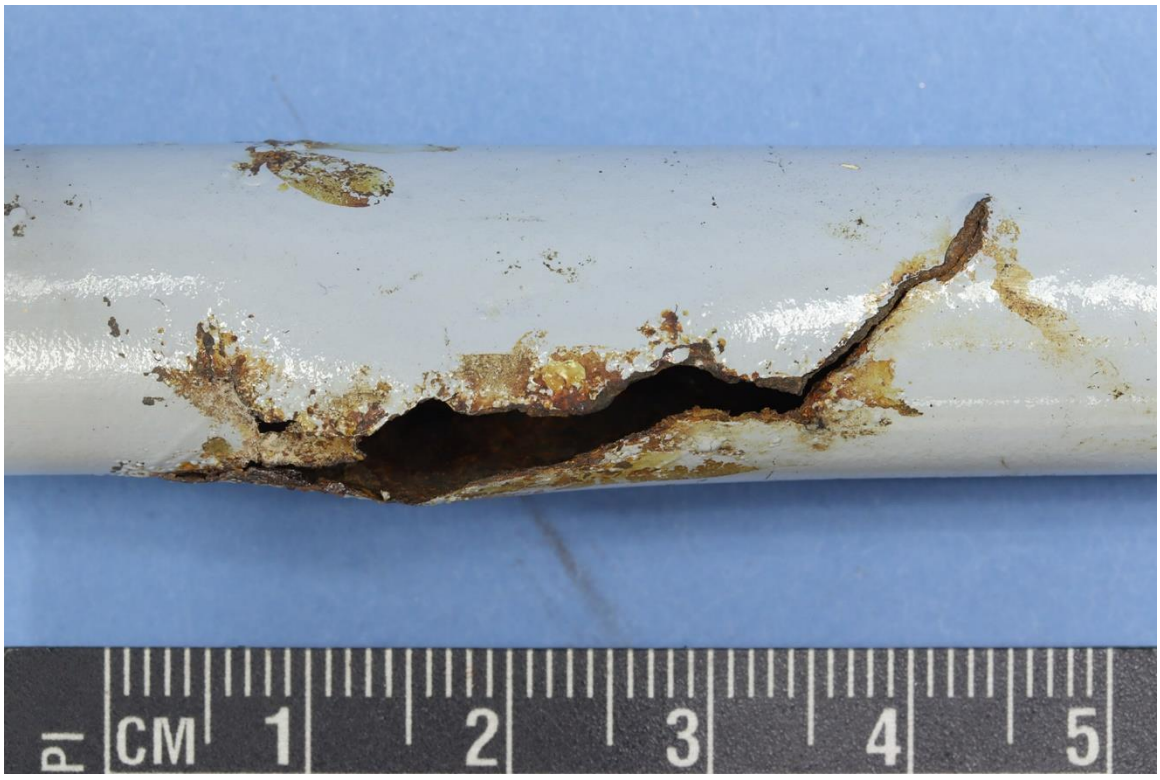
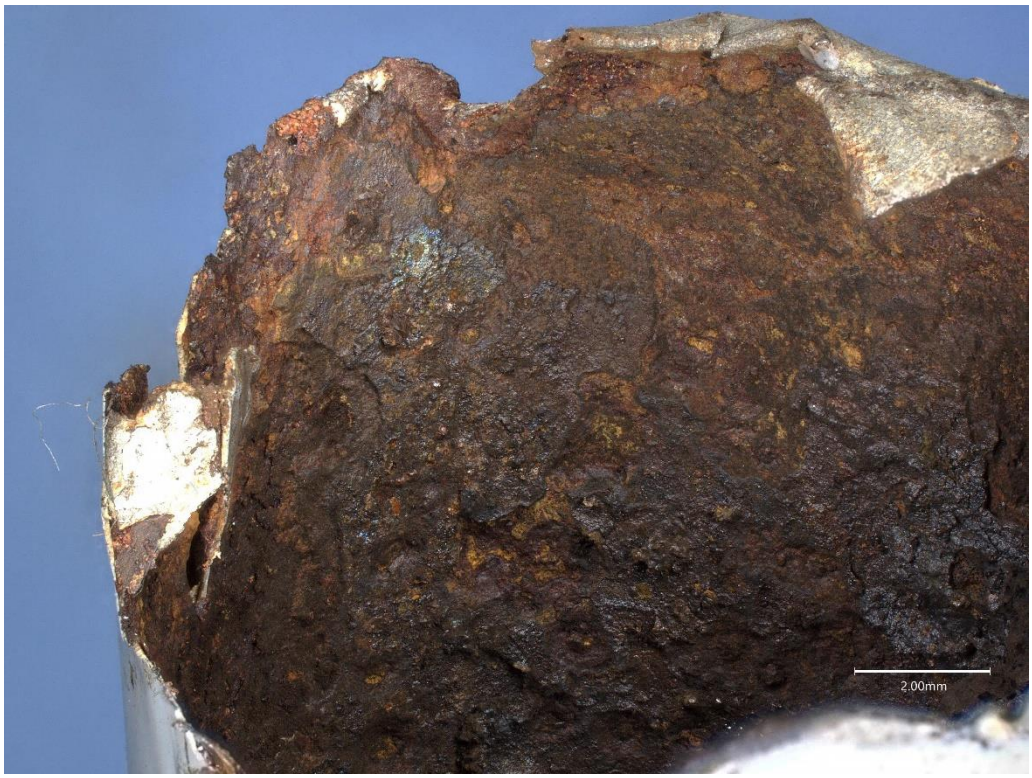


Figure 3: a) and b) Two views of the longitudinal fracture at the upper end of the control rod.

c) 

Figure 3 (cont.): c) upper end of control tube showing staining from the rubber boot in the vicinity of the witness hole.

a)



b)

Figure 4: Images of corrosion on the inner tube surface, a) near the fractured lower end and b) near the middle of the tube.